

UNITED STATES MARINE CORPS
Utilities Instruction Company
Marine Corps Engineer School
PSC Box 20069
Camp Lejeune, North Carolina 28542-0069

U-10C01
OCT 99

STUDENT HANDOUT

SHOWER FACILITY, BARE BASE

1. Terminal Learning Objective:

a. Provided a Shower Facility, Bare Base, earplugs, fuel, a water source, a power source, and references, operate the shower facility in accordance with TM-08444A-15/1 and TM-10006A-14&P/1. (1171.02.02)

b. Provided a Shower Facility, Bare Base, earplugs, fuel, a water source, a power source, and references, perform preventive maintenance on the shower facility in accordance with TM-08444A-15/1 and TM-10006A-14&P/1. (1171.04.02)

2. Enabling Learning Objectives:

a. Given the necessary equipment, a water source, tools and materials, set up the unit in accordance with TM-10006A-14&P/1. (1171.02.02a)

b. Given the necessary equipment, a water source, tools and materials, conduct operator maintenance in accordance with TM-10006A-14&P/1 (1171.04.02a)

c. Given the necessary equipment, a water source, tools and materials, start the unit in accordance with TM-10006A-14&P/1. (1171.02.02b)

d. Given the necessary equipment, a water source, tools and materials, shut down the unit in accordance with TM-10006A-14&P/1. (1171.02.02c)

e. Given the necessary equipment, a water source, tools and materials, prepare the unit for storage in accordance with TM-10006A-14&P/1 (1171.02.02d)

BODY

1. Characteristics and capabilities:

a. Each Bare Base Facility consists of a base assembly with two body stalls, a top frame assembly with attached shower heads, side supports, and vinyl covering. The two body stalls and six shower units are joined, to make a 12 person facility. Doors are provided to

close the two open ends of the shower facility. The water supply and drainage is provided by electrically powered pumps, while heated water is provided by an M-80 Water Heater. External power to operate the facility is provided by a separate power source capable of delivering **208 volts, 3 phase, 60 cycle power.**

b. In full operation, properly attended, the unit is capable of processing approximately 200 people per hour. Based on showering for 2 1/2 minutes with a 1 minute changeover time. There will be 17 changeovers per hour.

c. Shower section personnel:

(1) The shower section provides a shower service for the troops operating in the field.

(2) Two operators - Their task consist of the operation of the pump assembly, M-80 Water Heater, and repair and maintenance of the Bare Base Shower Facility.

2. Description of components:

a. Base assembly: The shower base is a fiberglass assembly provided with a central drain and reinforced support sockets for the side support poles. The drain is provided with nipple-type male couplings for connection to drain hoses.

b. Shower Frame: The shower framework consists of an aluminum top frame, fitted with a shower supply manifold with two shower heads, and two attached soap dishes. **Each of the 12 shower heads produces 1.5 gpm.** The top frame is supported by six side support poles which fits into the reinforced support sockets in the base assembly.

c. Pump Assembly: The shower facility pump assembly consists of a water supply pump assembly, drain pump assembly, temperature regulator, and an electric switch box for connection to the power supply. The water supply is pumped by the water supply pump assembly to the M-80 Water Heater. Heated water is then returned to the pump assembly and mixed by the temperature regulator, with cold water directly from the pump. The drain pump assembly provides drain suction for the shower facility. **Both pumps are rated at 18-20 gpm.**

d. Hoses: Shower assembly supply and drain manifolds are connected to each other and to water sources by hoses fitted by lever-type connectors (**quick disconnect fittings**). Supply hoses are 1-inch in diameter, and drainage hoses are 2-inches in diameter.

e. Wiring Harness: Two electrical wiring harnesses are provided to connect the shower pump assembly and M-80 Water Heater to an external power source. Both are needed for proper operation of the Bare Base Shower Facility.

f. M-80 Water Heater: The M-80 Water Heater is a self contained fuel-fired water heater that can be used to provide heated water to the shower. It is designed to heat incoming water to a temperature between 180 degrees (F) and 195 degrees (F). The water pump assembly supplies cold water to the water vessel lower manifold at a rate of 5 GPM. The incoming water flows into two chambers which surround a combustion chamber in the water vessel. As water is pumped through the vessel chambers, it is heated by hot air surrounding the vessel chambers. Heated water leaves the vessel chambers through the upper manifold. The water heater is equipped with an operating limit control, a high limit control, low water probe relay, a relief valve, and a drain cock.

g. Fuel system: Consist of the following:

(1) A drum fuel adapter assembly mounted either on a 55-gallon drum or a 5-gallon fuel can provide the fuel supply for the water heater.

(2) A fuel pump, when powered, pumps fuel from the fuel supply through the fuel filter. A 5 GPH fuel supply is needed for proper water heater operation.. Fuel from the fuel pump is supplied at **100 PSI** to the burner nozzle through a solenoid valve, and a manually operated fuel shut off valve. A 0-160 PSI pressure gauge is installed between them to monitor the fuel pressure.

(3) The fuel filter is a self contained, automatic type, with a metal cartridge which can be cleaned without shutting the burner down. A "T" handle on top of the filter is rotated to clean the cartridge screen at proper maintenance intervals.

h. Burner Head Assembly:

(1) The burner head assembly is equipped with a single fuel line that provides fuel to the fuel burner nozzle. Two radio shielded, high tension cables provide an ignition spark. A sight glass tube which is mounted on the electrode assemble provides a means to check the burner electrode ignition spark. It also has an ultraviolet scanner that contains an ultraviolet-sensitive gas discharge tube, which monitors UV radiation during burner operation.

3. Setup procedures:

a. Site selection:

(1) The shower facility should be placed on a site with adequate overall size to accommodate the shower facility, a changing tent, and water storage tanks. The site should also be located on firm, level ground that will support the weight of the Shower Facility.

(2) The site should be located approximately 100 ft. from camp, down stream.

(3) Site selected should also be accessible to personnel taking shower, with adequate cover and concealment.

(4) Good road nets are needed for vehicles off-loading water supply, especially under blackout or restricted light conditions.

(5) The site selected should also be on well drained ground within easy hook-up distance to your water storage and external power source.

b. Installation:

(1) Position six base assemblies in a relatively level area.

(2) Tilt three base assemblies from one side toward the center to expose the drain manifolds.

(3) Remove pipe caps from drain manifolds by opening caps locking levers. Use caution to avoid pinching fingers.

(4) Install three short 2"x58" drain hose assemblies by pulling hose coupling levers away from coupling and sliding coupling over drain manifold male coupling. Secure hose by closing coupling lever. Install pipe cap on remaining manifold out coupling.

(5) Lower Base units together.

(6) Repeat steps 2 through 5 for other Bases.

(7) Push the base units together so that sides are touching together.

(8) Install five outer vertical support poles in each base assembly with small peg facing upward. Do not install inner center support pole at this time.

(9) Fit the vinyl cover over the frame assembly.

(10) Position frame assembly over the vertical poles with the overhang facing the center line, and the vinyl cover is placed inside of the vertical support poles. Position the vertical pole pegs in the frame assembly until firmly seated on vertical poles.

(11) Lift the outer edge of the frame assembly and install the remaining vertical pole in the outer center hole of base assembly.

NOTE: Tell the students to place the vertical poles in the base assemblies softly to avoid putting holes in the assemblies.

(12) Pull the vinyl cover over the framework and secure it by using the velcro straps provided. Once the vinyl covering covers the framework, secure the bottom edge of the vinyl cover by using the velcro straps at the bottom edge of the cover to the base assembly.

- (13) Repeat steps (8)-(12) for remaining five base assemblies.
- (14) Once the six base assemblies are set up, use the velcro straps provided on the frame assembly center overhangs to secure facing frame assemblies together.
- (15) Match the inner velcro strips on the vinyl cover top edges with outer velcro strips on the facing covers and secure them together.
- (16) Position the shower floor covers over the central walkway and secure it by using the velcro strips on floor edges to the inner edges of the base assemblies.
- (17) Position the doors over the openings and secure them by mating the velcro strips on the inside of door to the cover.
- (18) Remove shower manifold caps.
- (19) Route the six **1" x 25.5" black water supply hoses** through openings of the vinyl covers and connect the hoses to the shower manifolds. Water supply hoses extending from the front of shower assembly are connected together to form a cross over pipe.
- (20) Route one end of the long **1 inch red water supply** hose through the vinyl cover and connect it to one of the two rear shower manifold connectors.
- (21) Install cap on remaining manifold connector.
- (22) Position water pump assembly and M-80 Water Heater close enough to the unit to install the electrical wiring harness. Once the water pump is in place install the opposite end of the long **1 inch red water supply hose** to the temperature regulator outlet.
- (23) Install a long **1 inch black water supply hose** on the suction end of the water supply pump.
- (24) Attach strainer to the opposite end of the long **1 inch black supply hose** and position the strainer in the water so that the filter screen is completely submerged at all times. Do not place filter screen directly on a muddy or salty surface. If necessary, prop filter end up using boards or other available items.
- (a) If using a closed water supply, connect main water supply hose directly to source output connectors. Adapters may be required to do this.
- (25) Install the Y-Connection to the two drain hoses that are coming from the rear of the bare base assemblies.
- (26) Install the male end of the **2 inch long black drain hose** to the female end of the Y-connection.

(27) Install the opposite end of the **2 inch long black drain hose**, to the suction end of the drain pump.

(28) Install the **female end** of the other **2 inch long black drain hose** to the discharge end of the drain pump.

(29) Route opposite end of the **2 inch long black drain hose** to an approved waste water drain site/storage tank.

(30) Connect the male end of the **red M-80 supply hose (1½" x 30")** to the discharge end of the water supply pump. Connect the opposite end, to the inlet connector on M-80 Water Heater.

(31) Connect the **(1" x 61") red M-80 supply hose** to the heater discharge valve. Connect the opposite end to the temperature regulator inlet.

(32) Connect fuel hoses to fuel adapter and fuel filter.

NOTE: The connector that is located on the top of the fuel filter is the suction end, the bottom connector is the return end.

(33) Install the smoke stack on M-80 Water Heater.

(34) Connect 50 ft. power cable lead to the 10 ft. power cable adapter. Connect one power cable lead to the water pump assembly socket, which is located on the switch box. Connect the other lead to the M-80 Water Heater socket.

c. Preposition valves and switches:

(1) Ensure that the switches on the pump assembly and the M-80 Water Heater are in the off position.

(2) Ensure that the air damper is fully opened.

(3) Ensure that the fuel shut of valve is closed.

(4) Close the heater discharge valve.

(5) Open the air bleed valve.

(6) Set temperature to 160 degrees.

d. Conduct before operation checks and services:

(1) Check all hoses and power cable connections and exposed wires.

(2) Inspect unit for cracks, missing or damaged parts.

(3) Check fuel supply.

(4) Prime water supply pump.

(5) Ensure that power source is grounded.

(6) Verify that a serviceable fire extinguisher is located near the M-80 Water Heater.

4. Startup procedures:

a. Turn on external power source:

b. Pump Assembly:

(1) Jog the switch to the water supply pump to ensure that the pump is rotating in a **(clockwise)** manner. The switch is located in the panel next to the power cable socket.

(2) Turn on the water supply pump switch.

(3) Wait for a steady stream of water to exit the air bleed valve.

(4) Once you have a steady stream of water coming from the air bleed valve, close the air bleed valve.

(5) Open the heater discharge valve, this allows the water to circulate. Check all supply hoses for leaks, and ensure that the shower heads are open. If any are found, turn off the water supply pump and correct the problem before proceeding. If there are no leaks **close the heater discharge valve.**

NOTE: The Heater discharge valve can remain open at this point. But if your in a cold environment, the heater discharge valve should remain closed until the temperature gauge on the M-80 Water Heater reaches 160 degrees (F).

(6) Turn on the drain pump.

c. M-80 Water Heater:

(1) Depress flame safeguard control unit reset button, inside of the M-80 Water Heater control box, to ensure that flame safeguard control unit is active and that the water heater can start.

(2) Jog the switch to the M-80 Water Heater to ensure that the blower motor is rotating in a **(clockwise)** manner.

(3) Turn on the power switch to the M-80 Water Heater.

NOTE: The M-80 water heater is in the 7-second purge period.

(4) While the blower motor is energized quickly check for spark at the electrodes by looking through the sight glass located at the center of the burner assembly.

(5) Position yourself near the fuel solenoid , wait for a "click" to be heard from the fuel solenoid valve. This indicates that the fuel solenoid is energized and is now open. **(once the solenoid clicks you have 7-12 seconds to open the fuel shut off).**

(6) Wait until the fuel pressure gauge reaches 100 psi.

(7) Once the fuel pressure reaches 100 psi, open the fuel shut off valve 1/4 turn **counterclockwise**. The burner should ignite within a few seconds.

(8) Check exhaust gases coming from the smoke stack, It should be clear.

(9) Check the flame by looking though the large sight glass on the M-80 Water Heater.

(10) Open heater discharge valve.

NOTE: The M-80 Water Heater functions automatically. When the water inside of the M-80 Water Heater reaches a temperature of 160 degrees the M-80 Water Heater will shut off. Once the water temperature drops below 160 degrees, the M-80 Water Heater will automatically come on.

5. Conduct during operation check and services:

a. If the fuel pressure gauge drops to zero when opening the fuel shut off valve perform the following:

(1) Close the fuel shut off valve and turn off the power switch to the M-80 Water Heater.

(2) Wait 15 seconds and repeat steps (3)-(8) until fuel pressure is maintained.

b. If fuel pressure is not obtained and the M-80 Water Heater does not ignite the M-80 Water Heater will automatically shutdown. The M-80 Water Heater buzzer will sound. If the buzzer sounds:

(1) Close fuel shut off valve.

(2) Turn the M-80 Water Heater switch off.

(3) Wait approximately 1-2 minutes. Reset the Flame Safeguard Control Unit by pressing in the red reset button.

(4) Then repeat steps (3)-(8).

c. Operational Adjustment:

(1) First set shower temperature by adjusting the mixing valve located on top of the temperature regulator, (turn the mixing valve counterclockwise to provide hot water to the shower. If the mixing valve is turned clockwise it allows cold water to the shower).

(2) Ensure that the temperature control knob is set at 160 degrees. The M-80 Water Heater should shut down at that temperature.

(3) The high limit control should shut off the M-80 Water Heater between 180-195 degrees F. It can be adjusted only when the unit is in full operation.

(4) Check the temperature gauge mounted near the high limit control to verify proper operation of the high limit control, and manual temperature setting.

(5) Check the fuel pressure. It should read 100 psi.

(6) If the exhaust gases coming from the smoke stack are not clear, adjust the air band on the air damper. The air band is adjusted to affect the ratio of fuel vapors mixed with air. This ratio determines proper fuel combustion. Normal vibration of the water heater may change the air band adjustment, so it is necessary to frequently check it for the presence of smoke.

(7) Check fuel and water supply periodically.

(8) Visually inspect the entire water heater and pump unit for leaks or other damage incurred during operation.

6. Shut down procedures:

a. Turn off the fuel shut off valve.

b. Turn off switch to M-80 Water Heater.

c. Let the water circulate approximately 5 to 10 minutes to cool down the system, or until the water temperature drops below 100 °F.

d. While the M-80 Water Heater is cooling down, open all shower heads and allow the drain pump and supply pump to operate until drain water is clear.

e. Once the water is clear, turn off the water supply pump. Turn off the drain pump when the base assemblies are clear of water.

7. After operation checks and services:

a. A daily visual inspection of the shower facility will be accomplished by the operator. The operator will ensure that all components and accessories are thoroughly inspected.

b. The operator will ensure that the drain pump will receive two squirts of GAA grease in the grease fitting on the arm of the drain pump.

c. Ensure that operators wear gloves when cleaning the shower assembly to prevent hand fungus.

8. Disassembly and storage:

- a. Disconnect pipe caps.
- b. Disconnect fuel hoses from M-80 heater.
- c. Disconnect hose all hoses and let them drain.
- d. Disconnect caps and hoses from shower manifold.
- e. Install caps.
- f. Remove and clean all vinyl covers
- g. Remove velcro straps and remove fabric covers.
- h. Remove top frames.
- i. Remove vertical poles.
- j. Lift on side of the bare bases and disconnect the short 2 inch drain hoses and install drain caps.
- k. Clean all bare base assemblies and allow to drain.
- l. Clean M-80 Water Heater and ensure M-80 is completely drained.
- m. Clean pump assembly and ensure that pump assembly is completely drained.
- n. Inspect all components for damage.
- o. Allow all components to air-dry thoroughly.

REFERENCES:

TM-08444A-15/1
TM-10006A-14&P/1